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ABSTRACT

Videodiscs have four characteristics that are valuable to the researcher, namely, that: (1) the contents of the videodisc are permanent, allowing multiple repetitions using the same material; (2) the order and sequencing of the material may be changed according to the focus of an instructional program or research study; (3) videodiscs can be integrated with many types of delivery technologies and teaching models; and (4) a videodisc can be used by different investigators for use in replications of an experiment. Two research paradigms utilize the advantages of a videodisc. Designed to determine the effects of each component of a lesson, the first compares two or more versions of lesson in which the only difference is the component being studied. The second focuses on the interrelationships between instructional components and can be used to relate the components to cognitive styles and other personality variables in complex interrelationships. It is argued that the use of these paradigms in educational technology research would result in a higher quality of research, and in studies exhibiting more sensitivity to the effects of different versions of components of instruction than is the case with most currently available studies. (15 references) (DB)

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TWO RESEARCH PARADIGMS FOR USE WITH VIDEODISC-BASED STIMULUS MATERIAL IN RESEARCH ON INTERACTIVITY AND MEDIA EFFECTIVENESS

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Videodiscs are hardware, not software, and are either further away from being courseware. Nevertheless they are often treated and discussed as if they are instruction, not the carrier of instruction. As Marshall McLuhan probably would have said, the medium has become the message.

This particular combination of medium and message has special significance for research in learning and instructional theory building, for research in instructional design models, and for media comparisons research.

VIDEODISCS IN RESEARCH

Videodiscs have four characteristics that are valuable to the researcher. First, the contents are permanent, and so are repeatable. Second, the order and sequence of the frames can be changed with each repetition. Third, videodiscs can be integrated with many types of delivery technologies and teaching models. Fourth, the videodisc, as well as the whole delivery system it is integrated with, can be transferred from investigator to investigator for use in replications of an experiment.

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The researcher who takes advantage of these characteristics of the videodisc can avoid many of the problems that have beset instructional research in the past. Studies can be replicated in exact detail with new subjects. Reviewers would be able to examine the entire experiment to determine the nature of the instruction. When several experiments utilizing a particular instructional method fail, and when several others succeed at achieving the instructional goals, reviewers can examine the instruction used in each experiment to determine the differences in the stimuli material.

This ability would lead to the generation of hypotheses concerning the cause of the differences in outcomes among the experiments. And, unlike pre-videodisc days, these hypotheses can be tested, since the materials needed to test them with are still available on videodisc.

The possibility of such examinations of stimulus materials makes possible the application of such statistical methods as meta-analysis to fine structural detail that has not occurred up to now.

Two examples of what can be done are provided by the media-comparison and instructional-methods comparison studies that used to be popular (Bovy, 1981; Clark, 1983; Clark and Snow, 1975; Fleming and Levie, 1978; Grabowski, 1988; Hannafin, 1985; Levie, 1987; Salomon and Gardner, 1984; Schramm, 1977; Shlechter, 1986; Torkelson, 1987). These types of studies often concluded that no significance could be found between the two methods being compared. Possible reasons given for the inconclusive results usually included several of relevance here.

It was often argued that more time and expertise were expended upon one treatment than on the other. The argument was also often given that there is no way to compare such studies with each other because no clear, detailed explanation was normally available concerning what happened during the treatment phases. It was often not even clear that two methods having the same name were even the same method, rather than two very different variations producing entirely different effects.

The argument was often made that differences between the two methods existed, but that outcome measures were not powerful enough to demonstrate this. (This argument is still often given in reviews of computer-based instruction vs. stand-up instruction.)

In reviewing these studies, Grabowski found that

> the questions asked were the wrong ones, the methodology flawed, and the results insignificant, along with one major problem being the lack of a unifying conceptual framework (Grabowski, 1988, p.33).

These studies can now be revisited. Exact duplication of these experiments is not possible, since no one, even the experimenters, even at the time they were occurring, knew what happened in them. Also, broad comparison studies of the type generally performed (and still performed) with loosely-defined treatments, were generally ill-conceived. These experiments, as originally reported, are not recommended by anyone as possibly contributing to our store of knowledge or to practice.

However, with the videodisc, comparison studies can be designed which lack these faults, and which would possess the potential of contributing useful knowledge.

First, the same material can often be used in both treatments, since the sequence or the mode of presentation is usually what is being compared. Videodisc frames can be programmed in any order, and can be accessed by any number of devices for presentation. Video projectors and the new "Podium" program developed by IBM would allow the comparison of a videodisc-based stand-up instructional program with the same material presented in some other mode.

Further, by integrating computerized testing, interspersed questions and the automatic recording of key strokes, it is possible to measure effects as finely as is necessary. If any differences in outcome between two treatments exists, it can be ferreted out, providing the experimenter is a good enough thinker to ask the right questions. Data collection is no longer the problem. Even non-obtrusive measurement of fine detail is now possible.

Comparison studies of the type commonly done in the 50s and 60s have almost been stamped out, although occasionally they are still performed. Except for certain special functions, such as to show that a new media teaches well enough to deserve further study, we would not like to see these kinds of studies revived. However, there are at least two comparison paradigms that are worth pursuing, and both are best carried out using videodiscs.

TWO PARADIGMS

The first paradigm is designed to determine the effects of each component of a lesson. The lesson can be presented in two versions, with the only difference between them being the component under study.

Grabowski (1988) that the disc is particularly useful in this paradigm. The stimulus material can all be put on a videodisc and accessed through a computer. Each experimental run can be conducted using the same material, but with the computer re-programmed in accordance with the requirements of the version of the component under study.

Further, the exact frame-by-frame, key press by key press, path of each subject through the lesson material can be recorded and analyzed. A variation on this paradigm then becomes possible. Instead of asking about the effect upon the short or long term retention rate when using different components (a behaviorist approach), questions can be asked about different processing paths students take under different conditions (a cognitive approach). Then, using exactly the same stimuli material from the disc, the two outcomes can be related (a holistic approach).

This paradigm has been followed in a number of studies, for example, in Ho, Savenye and Haas, 1986; Hannafin and Colamiaio, 1987; and Gay, Trumbull and Smith, 1988.

The second paradigm is much less used, and probably not as well understood. This paradigm stems from those used in animal learning research and research on the operant analysis of human behavior. In this paradigm, a single subject is used in multiple trials, acts as his/her own control, and is compared to his/her own self under all of the various conditions being studied.

This paradigm is particularly useful for determining the interrelationships between instructional components, since all variables in the subject remain the same throughout the experiment. This paradigm can also be used to relate these components to cognitive styles and other personality variables in complex interrelationships.

One particular advantage of this paradigm is that, since each subject is run completely independently, and is analyzed initially as a single-subject multiple-trial case, not all subjects in an experiment need be available at the same time. Providing that certain conditions are satisfied, or if the experiment is such that these conditions can for practical purposes be ignored, single subjects can be run when they are available, and analyzed initially

as single-subject experiments. Then, when enough such experiments have been accumulated, they can be pooled and re-analyzed as groups.

One condition to be met is that historical effects do not occur, causing some of the subjects to be effected in ways that the rest are not. A second condition is that when subjects are combined into groups, the subjects/trials must remain independent, and they must be combined using random distributions.

One study using this paradigm is being conducted at Syracuse University by Dills, Grabowski and Kerr. In this experiment, the interactions between Educational Cognitive Style of the subject and the style in which the stimulus materials are written are being explored using an interactive videodisc supporting a CBI program.

Other studies are planned using this same disc and computer program, slightly modified. These studies include work with advance organizers, accelerated learning and additional personality variables.

Analysis of these experiments will use, in the group phase, the profile matching software presented to the AMTEC convention in Saskatchewan a few years ago (Dills and Keppler, 1987), as well as more conventional methods such as regression analysis.

The single-case studies will be analyzed using the celeration line and the method of the split halves.

CONCLUSIONS

We are firm believers in the value of the videodisc as an aid to research, especially when combined with CBI. This belief is especially strong when the research question involves interactivity.

Two paradigms have been described which we believe make maximal usage of the advantages inherent in the videodisc. One of these paradigms is best suited for examining media and method comparison studies. Further, these types of studies can be refined into useful studies comparing the effects of components of instruction and variations of these components.

The second paradigm seems best suited to study the effects of cognitive style, personality and other external (to the instructional sequence or mix of instructional components) variables on instructional components. This paradigm is also suited to studies in which few subjects are available at any one

time, which would reduce the study to a pilot study using other paradigms. Use of this paradigm in this manner is limited by underlying assumptions to specific conditions, but these conditions often exist within the contexts being studied in learning from media.

The authors argue that these paradigms in consortium with interactive videodisc technology should be used in educational technology research much more often than they are. We believe that this would result in a higher quality of research, and would result in studies exhibiting much more sensitivity to the effects of different versions of the components of instruction, than is the case with most currently available studies.

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